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THE DIAGNOSIS OF TUMORS.

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In my paper of last year before this Association I expressed my views on the value of a microscopical examination in the diagnosis of morbid new growths. I also demonstrated by cases which came under my personal observation how important it was to arrive at a correct diagnosis, for upon such diagnosis depends the treatment and prognosis, life or death of the patient. To-day I wish to dwell upon the requisites necessary for an accurate diagnosis, the methods of examination, and their successful application.

The pathologist who is called upon to judge whether a small piece of tissue is normal or abnormal and, if abnormal, whether it be benign or malignant, must have, in the first place, a thorough knowledge of the anatomical and histological elements of the various tissues of the body. Furthermore, he should be acquainted with the various steps in the development of such tissues, their transformations and processes of growth during the embryonic stage, and the functions which they are to assume at the close of fœtal life. The onward tread of science within the past few years has necessitated the pathologist to study more the causation of disease and diseased processes and to trace, if possible, the origin to a specific germ or bacterium. As yet bacteriologists have not definitely taught us of this causative relation, although some observers have made cultures from and discovered bacteria in the tissues of tumors.

These allied sciences, stepping-stones to pathology, must be fully mastered if the investigator expects to attain anything like accurate results. Especially in histology is much experience and personal application essential. No one can hope to pass judgment upon a diseased tissue if the picture and nature of the healthy normal tissue be not continually before his eye and mind. The only way to secure this indispensable knowledge is by careful, painstaking work with the microscope in a well-equipped histological laboratory.

Having this fundamental knowledge and training, the investigator must follow some classification, and none is more perfect and universally accepted than Virchow's—based upon the germinal layers from which the original tissue giving rise to the neoplastic growth was derived.

It is often by exclusion that a diagnosis must be made, and to follow out this process one must be acquainted with the different forms and varieties, divisions and subdivisions. With the satisfaction of being able to place every tumor under its proper head, it is not a very difficult task to compare the cells of the mesoblastic or connective tissue growths with their normal prototypes and to classify them accordingly.

Characteristics of Tumors.

We know by observation that tumors tend to reproduce their like, and that this tendency is inherited sometimes through several generations. As a rule, the same characteristic cell is reproduced, and thus the knowledge gained from the father may be applicable to the son.

Tumors follow in the majority of cases the type of tissue from which they spring, or, in other words, are homoplastic. A neoplasm growing from muscle, or nerve, or cartilage, is generally composed of that particular form of tissue as the case may be. Sometimes, however, the tumor tissue changes to that of a higher type, as a fibroma to a chondroma, but never a fibrous tissue to an epithelial. This last characteristic is, according to an important law, known as the specific nature of tissues, founded upon the fact that a tissue derived from one germinal layer cannot change to a tissue developed from a different germinal layer. Hence a tumor of the mesoblastic or connective tissue group is not liable to become a tumor of the epiblastic group.

The location of tumors is an important aid to the pathologist, for, as we have just seen, tumors tend to grow from tissues typical to their own. Malignant tumors, on the other hand, grow where tissues derived from the different germinal layers meet, as about the lips, larynx, rectum, etc., where there is constant irritation, and in those organs with increased physiological function, as in the mammary glands, uterus, etc.

Being cognizant of these facts, the pathologist is prepared to listen to the clinical history and to make an examination of the growth *in situ*, or, if it has been enucleated, to examine it in the laboratory. The clinical history should never be underestimated or neglected; the daily condition of the patient as noted by the surgeon or family physician may give valuable information regarding the character and growth of the tumor, especially if it be a malignant one.

A tumor growing on dangerous ground in a subject past middle life accompanied with constitutional disturbances is, in the majority of cases, apt to be carcinomatous and calls for speedy action. On the other hand, a circumscribed, non-adherent, globular mass appearing under the skin or scalp may grow for years without the least danger or perhaps inconvenience.

The appearance of the neoplasm *in situ* gives many diagnostic points. To see the form, color, appearance of the central mass, edges, etc., in many cases alone solves the problem. The appearance of the myxoma, cholesteatoma, melanoma, and others is characteristic if not pathognomonic; and although it is not judicial to make a snap diagnosis and forego further examination, nevertheless in many cases the character of the tumor can be thus predetermined.

To the touch, the mass appears hard or soft, adherent or non-adherent, even or uneven, lobulated, sessile, or pediculated, as the case may be.

The condition of the neighboring organs, tissues, and glands should not be forgotten. Infiltration of the adjacent tissue and chain of lymphatics is quite characteristic of the carcinomata. In cases of suspected malignant disease of the internal organs the diagnosis is greatly strengthened by finding the lymphatic glands of the groin enlarged and hardened. The carcinomata and sarcomata are the only tumors which form metastases, the former through the lymphatic, the latter through the blood vessels.

The appearance of the tumor on section sometimes discloses important changes in its interior. As such may be mentioned a beginning of degeneration, formation of cartilaginous nodules, infiltration with calcium salts, hemorrhages, into its meshes, etc.

But the most important examination is still to be made, namely, the microscopical. The tumor may be examined in its fresh state or may be hardened and carefully examined at a later period. Many times circumstances demand an immediate examination and diagnosis. This may be done by hardening the small mass in a freezing microtome, or, better still, to tease carefully a small section and compress them between two cover glasses, grinding them slowly to make as thin a layer as possible. The cover glasses should then be separated by gliding one off from the other (not picking it off) and mounting temporarily in glycerine or brine. To stain these fresh specimens I use a 25 per cent. solution of glycerine and ammonia carmine solution, it serving at the same time as a mounting medium. The tumor cells take the stain kindly and permit of a quite satisfactory examination. To make permanent specimens I harden the tumor in alcohol and stain with hæmatoxylon or ammonia carmine.

Generally the characteristic tumor tissue is easily recognized and correctly diagnosed. Some trouble is encountered in diagnosing some forms of the carcinoses, especially if degeneration or breaking down of the alveolar structure has taken place ; but in such instances the complete examination must afford some light as to their character, and a probable diagnosis can be determined upon. Should such a tumor occur on dangerous ground several examinations by one or more skilled pathologists should be made and, if possible, the different views unified.

Bearing these few suggestions in mind, then, it is not the most difficult task to make a correct diagnosis of a morbid new growth.

To illustrate the value of preliminary examination I will cite a few cases of brain tumor which have lately come to my notice.

Case I.—A brain presenting a large ovoid mass in the left frontal lobe was brought me for examination. The tumor was gelatinous in appearance, soft, compressible, almost fluctuant. These few qualities left no doubt in my mind as to its being a myxoma, and the microscopical examination verified my diagnosis. These tumors are of rather frequent occurrence in the brain, since the neuroglia is allied to mucous tissue and is consequently prone to engender tumors of this variety.

Case II.—An autopsy was made on a man who intravitam was declared to have a tumor either in the interior or base of the brain. On removing the cerebrum from the skull a large pearly white mass was found at the base of the brain cephalad of the pons. It was composed of white, rounded pearls, with a nacreous luster, packed together in dense concentric masses. The peculiar appearance due to the closely packed thin cells is characteristic of the cholesteatoma, a tumor of endothelial or epithelial origin * growing from the membranes at the base of the brain.

Case III.†—A brain was sent me from a neighboring city for examination. I found the hypophysis or pituitary body—normally the size of a bean or pea—about as large as a marble and producing

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* Authorities differ as to its origin.

† Buffalo Medical and Surgical Journal, December, 1890, p. 286.

pressure upon the chiasma cephalad, and caudad it was partially planted in the space between the crura. On cutting the periphery a gritty, rasping sound was heard, and on cutting deeper the scalpel came in contact with a hard, stony substance. The cut surfaces were chalky white, with many glistening points, and crumpled into minute particles. My diagnosis was calcareous degeneration of the pituitary gland. On examining under the microscope minute crystals could be seen throughout the field, while the larger portions appeared dark by transmitted light, white and glistening by reflected light. On adding a drop of strong nitric acid under the cover-glass, these calcareous masses (carbonates and phosphates of calcium) dissolved and the evolution of carbonic-acid gas could be distinctly seen under the microscope.